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(21) Application number: **03188453**

(71) Applicant: **NISSAN MOTOR CO LTD**

(22) Date of filing: **29.07.91**

(72) Inventor: **NAKADA TSUTOMU**

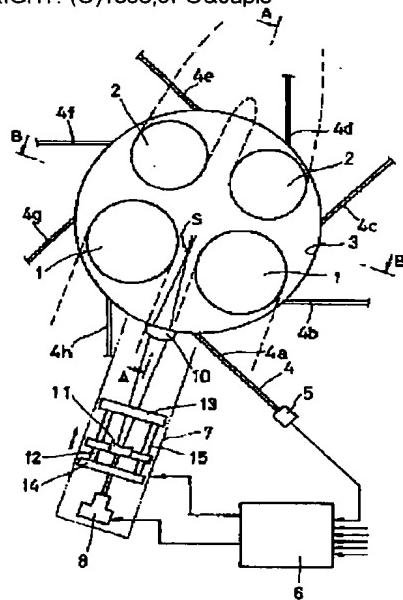
(54) IGNITION DEVICE FOR INTERNAL COMBUSTION ENGINE

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(57) Abstract:

PURPOSE: To restrain knocking due to self ignition of end gas by always minimizing end gas range to the utmost regardless of variation of the operating condition of an engine.

CONSTITUTION: Eight pieces of optical fiber 4 are arranged extending over the full circumference of a cylinder bore 3 at every 45°, so as to face their extreme end parts in the nearly tangential direction of the cylinder bore 3. Photoelectric conversion devices 5 are connected to the base end parts of the respective optical fiber 4, and the contour of a flame propagating face is detected by means of a contour unit 6 based on their output signals. A laser ignition device 7 is provided with an adjustable-focus unit 12, and the focus position, namely, the ignition position is variably controlled by the output signal of the contour unit 6, so as to approximate the contour of the flame propagating face to a prescribed form.



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(21) Application number: **56173934**

(71) Applicant: **NIPPON SOKEN INC NIPPON DENSO CO LTD**

(22) Date of filing: **29.10.81**

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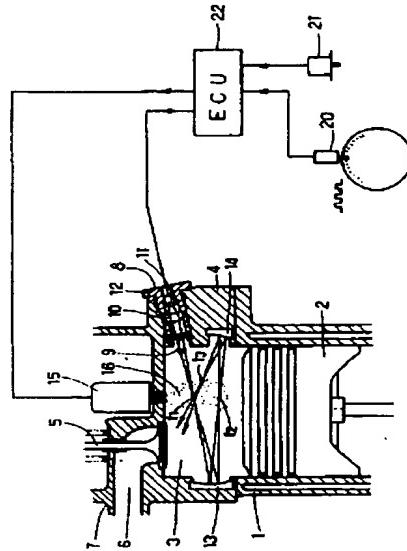
**(54) LASER IGNITING APPARATUS FOR INTERNAL COMBUSTION ENGINE**

**(57) Abstract:**

**PURPOSE:** To enable to ignite an internal combustion engine like a diesel engine of the type ejecting liquid fuel into a combustion chamber efficiently at the time of starting, by employing such an arrangement that light beams are focused at least at two points in sprayed fuel.

**CONSTITUTION:** Fine particles of fuel are ejected with vibration from a means 15 for feeding fine particles of fuel by passing current from an electric control means 22, such that the fine particles of fuel reach the focal points  $f_1$ ,  $f_2$ ,  $f_3$  and so on of light beams continuously or at the time when ignition is to be caused. Here, since the fine particles of fuel travel in the space of a combustion chamber 3, the greater the number of the focal points, the higher the probability of the fine particles of fuel passing through the focal points, so that fuel can be ignited in a reliable manner. Thus, fuel can be ignited effectively.

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**F02P 23/04**

(21) Application number: **62003371**

(71) Applicant: **KOMATSU LTD**

(22) Date of filing: **12.01.87**

(72) Inventor: **MURAKAMI TOSHIBUMI**

(54) **IGNITION DEVICE FOR INTERNAL COMBUSTION ENGINE** COPYRIGHT: (C)1988,JPO&Japio

(57) Abstract:

PURPOSE: To make ignition being small in electric power loss possible by distributing a laser beam sent out from a laser generator to each cylinder by means of a rotating prism rotating synchronously with an engine to irradiate it into a combustion chamber through a beam splitter and a condensing lens respectively.

CONSTITUTION: A laser beam generated by a large output laser generator 1 is distributed 10 each cylinder by means of a rotating prism 2 rotating synchronously with engine revolution, and the distributed laser beam is transmitted each cylinder 4 through an optical fiber cable 3. Each cylinder 4 is provided with a beam splitter 6 above a cylinder head 5 to divide the laser beam into fixed numbers (two in the figure). After adjusted to a proper focal length by a condensing lens 7, each laser beam is irradiated through a window 8 provided on the cylinder head 5 so as to focus in a combustion chamber 10. Thus a mixture in the combustion chamber is ignited for its combustion.

